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DEVICE FOR DISPOSITION AND DROPPING OF CARGOES FROM AN AIRCRAFT
(VERSIONS)

[Ustroystvo dlya razmeshcheniya i desantirovaniya грузов с
летател'ного аппарата (varianty)]

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The invention relates to equipment of aircraft, specifically to a device for the disposition and dropping of cargoes from an aircraft. /3*

This invention can be used most effectively for dropping cargoes, without a parachute, from altitudes of 100 - 500 m at flight speeds of 240-300 km/hr from IL-76 type aircraft. The cargoes can be various granulated cargoes in triple bags or other cargoes in a container which ensures their preservation upon landing.

Parachute dropping of cargoes has been widely used in recent years for urgent delivery of cargoes. But if it is necessary to deliver a large amount of cargo a parachute system with a pallet and cargo lashing means often exceeds the value of the cargo delivered.

A method of dropping granulated cargoes with pallets which does not use parachutes is known in which the cargoes after their dropping are separated from the pallet and land individually. The integrity of the cargo is ensured by a triple sack. In this method the cost of dropping is somewhat less, since the cost of the pallet with the means for fastening the cargo on the pallet is 15-20% of the cost of a parachute system.

The disadvantage of this method is that together with the cargo the pallet with the means of attaching the cargoes on it flies away irretrievably and if a large number of flights are necessary, the economic losses become considerable.

A device for disposition and dropping of cargoes from an aircraft (PCT/G B 88/00047) is known; it contains pallets for the disposition of cargoes on them, disconnectable attachments for securing the pallets on the aircraft, and disconnectable attachments for securing the cargoes

* Numbers in the margin indicate pagination in the foreign text.

on the pallets which are designed for ensuring the movement of the cargoes into the dropping position.

In spite of the fact that the attachments for fastening the cargoes on the pallets ensure disconnection of the pallets from the cargoes before dropping of the latter, the complexity of the design of the attachments reduces their reliability and leads to greater cost of the device as a whole.

The object of this invention is to devise a device for disposition and dropping of cargoes from an aircraft in which the attachments for securing the cargoes on the pallets would be simplified, while ensuring effective disconnection of pallets from the cargo before dropping of the latter.

This object is achieved in that in the device for disposition and dropping of cargoes from an aircraft, which contains pallets for disposition of cargoes on them, disconnectable attachments for securing the pallets on the aircraft, and disconnectable attachments for securing the cargoes on the pallets which are designed for ensuring the movement of the cargoes into the dropping position, as claimed in the invention there is a means for fixing the pallets in front of the dropping position, and each attachment for securing the cargoes on the pallet is made in the form of a net formed by one circular and several flexible radial ties, one end of each of which is connected to the circular flexible tie, and the other is made in the form of a loop which is connected using a peg to another loop which is fastened on the pallet. Over the pallets is a guide which is connected using a flexible tether to all the pegs for ensuring their extraction from the loops in front of the dropping position.

The suggested design of the attachments for securing cargoes on a pallet allows repeated use of pallets and a net for securing the cargoes; this reduces the cost of dropping cargoes.

In a preferred embodiment of the invention, in the device for disposition and dropping of cargoes from an aircraft, which contains pallets which are placed along the lengthwise axis of the aircraft and which are designed for disposition of cargoes on them, disconnectable attachments for securing the pallets on the aircraft and disconnectable attachments for securing the cargoes on the pallets and for ensuring movement of the cargoes under the action of their weight to the dropping position which is located in the rear part of the aircraft, as claimed in the invention there are guides for placing pallets on them and a means for fixing of pallets in front of the dropping position. Each attachment for securing the cargoes on the pallet is made in the form of net formed by one circular and several radial ties, one end of each of which is connected to the circular flexible tie, and the other is made in the form of a loop which is connected using a peg to another loop which is fastened on the pallet. Above the pallets along the aircraft is a guide which is connected using a flexible tether to all the pegs for ensuring their extraction from the loops in front of the dropping position.

According to one of the embodiments of the invention the means for fixing the pallets is made in the form of an elastic, flexible tie, one end of which is connected to the pallet, and the other to the aircraft. This design makes it possible to reliably fix the pallet at the instant the cargo is dropped overboard from it.

In another embodiment of the invention the circular flexible tie

is made compound, of two parts, two ends of which are equipped with rings interconnected by a peg which is connected to a flexible tether, and the other two ends are interconnected by an adjustable connection. This design of the circular flexible tie makes it possible to use the net for various dimensions of cargoes and simplifies the disconnection of the net from the pallet and the release of the load.

According to one of the embodiments of the invention, between the guides is a roller track on which the pallets are placed; here the means for fixing the pallets in front of the dropping position is made in the form of an elastic tie, one end of which is connected to a /4 pallet, and the other to the aircraft, and also a stop mounted on the aircraft outside the roller track along the path of the pallets, with a height which does not exceed the height of the roller track.

The presence of the stop makes it possible to accumulate pallets after jettisoning the cargoes; this increases the amount of cargo which can be dropped from an aircraft in one pass over the drop zone. This in turn reduces the number of passes of the aircraft over the drop zone for jettisoning the entire cargo.

According to another embodiment of the invention, the attachment for securing the cargoes contains a flexible tie with ends attached to the sides of the cargo compartment in the zone of the ramp.

Figure 1 shows a cargo pallet of the proposed device (bottom view); Figure 2 is the same with the cargo fastening net (plan view); Figure 3 the same (front view); Figure 4 shows the attachment for securing the cargo on the pallet (after dropping the cargoes); Figure 5 shows assembly A in Figure 3; Figure 6 shows a circular tie for the attachment for securing the cargoes on the pallet; Figure 7 shows the

means for fixing the rings of the circular tie; Figure 8 shows a diagram of loading the aircraft with pallets; Figure 9 shows section B-B in Figure 8; Figure 10 shows a connecting tether; Figure 11 shows the ground equipment for moving the pallets with the cargoes (plan view); Figure 12 shows section C-C in Figure 11; Figure 13 shows the stop.

The device for disposition and dropping of cargoes from an aircraft contains pallets 1 (Figures 1-5) for disposition of the cargoes 2 on them. Each pallet 1 is made of plywood and has four lengthwise 3 and four transverse 4 stiffening ribs. The lengthwise ribs 3 are made of plywood,, and the transverse ribs 4 are made from a metal section. On the side of the pallet 1 which is the forward side in the flight direction, there are two openings 5, into which the ends of a flexible tie 6 are fastened. Along the perimeter of the pallet 1 there are ten openings 7 in which loops 8 are placed.

The device includes disconnectable attachments 9 for securing the cargoes 2 on the pallets 1. Each attachment 9 is made in the form of a net formed by one circular 10 and ten radial 11 flexible ties-belts. On the ends each tie 11 has loops 12 for connection to the tie 10 and to one of the loops 8 of the pallet 1 to which it is connected using a peg 13 (Figure 5). The tie 10 (Figure 6) is made compound, from two parts, two ends of which on the ends have rings 14, 15 of larger and smaller diameters, interconnected by a tape 16, and the other two ends are connected to one another using an adjustable connection 17. Near the ring 15 on the tie 10 there is a loop 18 (Figure 7). In the cargo compartment of the aircraft in its upper part front 19 (Figures 8, 9) and rear 20 transverse beams are mounted on which the guide cables 21 are fastened.

Each net 9 is connected to a cable 21 using a flexible tether 22 (Figure 10) of capron tape, on one end of which there is a snap hook 23 for connection to the corresponding cable 21, and on the other end a loop 24 which connects the flexible tethers 25 which are connected in turn to pegs 13 (Figure 4). Each tether 25 is connected using clamps 26 to the corresponding flexible tie 11. In the middle part of the tether 22 a peg 27 is placed which is designed to fit into a loop 18 and to thus fix the rings 14, 15. To remove the net 9 from the cargo there are flexible tethers 28 which connect the flexible tie 10 to the loops 24 of the tether 22.

The attachments 9 for securing the cargoes 2 on the pallets 1 contain a means for disconnecting the net 9 from the cargo 2 and the pallet 1, which is made in the form of a flexible tie 29 (Figure 11), the ends of which are fastened to the sides of the cargo compartment in the ramp zone, and the middle part is connected to the rear beam 20.

The device includes the ground equipment which is intended for disposition of the pallets 1 with the cargo 2 in the cargo compartment and for ensuring their directed displacement along the compartment when loading and when dropping. The equipment is easily removable and contains central 30 and side 31 rails (guides) on which roller tracks 32 are mounted.

The central rails 30 are made in the form of two interconnected channels 33 (Figure 12). On the lower flanges of the channels 33 plungers 34 are mounted on which the roller tracks 21 are placed. The upper flanges and vertical walls of the two parallel channels 33 are used as the guides for the pallets 1 when they are moved along the cargo compartment in loading and unloading.

In the part of the rails 30, 31 which is the front part in the flight direction, two stops 35 are attached for limiting the motion of the pallets 1 toward the crew cabin. One the end of the central rails 30 located in the cargo compartment and on the ramp there are catchers 36 which ensure reliable delivery of the pallets 1 in the direction of the rails 30, 31 when the pallets 1 are loaded.

The device includes disconnectable attachments 37 for fastening the pallets 1 on the guide rails 31. The attachments 37 can be any known constructions which are suitable for this purpose.

The device also includes means for fixing the pallets 1 in the collectors 38 (Figure 11) which are located outside the roller tracks 32 along the route of the pallets 1. Each means is made in the form of an elastic flexible tie 39 (Figure 11), one end of which is connected to the lashing assembly (not shown) on the aircraft deck, and the other to the flexible tie 6 which is connected to the pallet 1. Altogether in the suggested embodiment of the device there are eight ties 39, four on each side. The ties 39 are made of capron tape.

The means for fixing the pallets 1 in the collector 38 also includes a stop 40 (Figure 13) which is mounted in the collector 38 outside the roller track 32. The height of the stops 40 does not exceed the height of the roller tracks 32; each stop 40 is made in the form of an angle section 41, on the upper edge of which on hinges 42 a rectangular plate 43 is mounted. On the surface of the section 41 which is the front in the flight direction, springs 44 are attached with free ends connected to a plate 43, and there is a limit stop 45 of angular cross section which limits the movement of the plate 43.

On the ramp in the zone of the collectors 38 panels 46 are mounted

which prevent the cargoes 2 from falling off the pallets 1 in the transverse direction when being dropped.

Before dropping, a cargo with a mass of 1200 – 1500 kg is loaded onto each cargo pallet 1 and covered with a net 9; here the belts 11 are distributed over the four sides of the cargo 2, then the lower loops 12 of the belts 11 are connected using pegs 13 to the loops 8 of the pallet 1. Then the rings 14, 15 of the belt 10 are connected between one another by inserting the peg 27 into the loop 18, and afterwards, using an adjustable connection 17, the belt 10 is tightened, thus ensuring tensioning of the belts 11 and fastening of the cargo 2 on the pallet 1.

The pallets 1 with the cargoes 2 are loaded into the aircraft from a truck using movable hoists 46 (Figure 9). Each pallet 1 is picked up by slings (not shown) and placed on the ramp between the guides 30, 31 on the roller track 32, and then it is manually advanced into the cargo compartment of the aircraft and fixed using one of the attachments 37.

In the described embodiment of the invention, twelve pallets 1 each along the port and starboard sides are loaded into the cargo compartment of the aircraft. The corresponding ties 39 are connected to the sides as four pallets 1 at a time are loaded on each side, and the snap rings 23 of the tether 22 are hooked to the cables 21.

The attachments 37 of the pallets 1 which are the first in the direction of movement to the collectors 38 are mounted using manual control, and the attachments 37 of the adjacent second, third and fourth pallets 1 are connected by tethers (not shown) to the first, second and third pallets 1 respectively.

Then the hatch of the cargo compartment of the aircraft is closed.

The suggested device works as follows.

In approaching the cargo drop zone the aircraft commander on the command of the navigator shifts the aircraft from horizontal flight into the nose-up attitude with an angle of $10-12^{\circ}$. On the command of the navigator the operators on the port and starboard sides open the attachments 37 of the pallets 1 which are last in the flight direction and which begin to move under the action of the force of gravity. At the instant the pallet 1 crosses the last roller of the roller track 32 the tether 22 is removed from the tie 29; in doing so the peg 27 is pulled out of the loop 18 and the circular 10 and radial belts 11 are loosened. As the pallet 1 continues to move, the pegs 13 are extracted from the lower loops 12 and the loops 8 of the pallet 1. Then the pallet 1 drops into the collector 38; in doing so the corresponding flexible tie 39 is tightened; this leads to the pallet 1 stopping, and the cargo 2 as a result of acceleration under the action of the force of gravity slides off the pallet 1 into the dropping position. The free pallet 1 under the action of the tension force of the flexible tie 39 moves in the opposite direction and is caught by the stop 40. The net 9 which has been released remains on the cable 21.

The attachments 37 of the following pallets 1 are opened after tightening the tethers which connect the attachments 37 of these pallets to the first pallets 1 when the latter begin to move. The cargoes 2 are jettisoned from the following pallets 1 in a similar manner. Accumulation of pallets 1 takes place in the collector 38.

After jettisoning the first eight pallets 1, the hatch of the cargo compartment is closed, the pallets 1 are taken from the collector 38 and fastened vertically to the sides of the aircraft, and the nets 9

are disengaged from the cables 21 and collected. The next eight pallets 1 are rolled onto the location of the previous ones, and they are prepared to be jettisoned in a second pass of the aircraft analogously to the first.

The number of pallets 1 from which cargo is jettisoned in one pass of the aircraft can be increased. This depends on the height of the roller track 32, the thickness of the pallet 1 and the dimensions of the landing zone of the cargoes 2. The number of cargoes 2 in one pass of the aircraft depends on the dimensions of the landing zone and on the dimensions of the aircraft.

Claims:

1. Device for disposition and dropping of cargoes from an aircraft, which contains pallets for the disposition of cargoes on them, disconnectable attachments for securing the pallets on the aircraft, and disconnectable attachments for securing the cargoes on the pallets which are designed upon their release to ensure the movement of the cargoes into the dropping position, characterized in that there is a means for fixing the pallets prior to the dropping position, and each attachment for securing the cargoes on the pallet is made in the form of a net formed by one circular and several flexible radial ties, one end of each of which is connected to the circular flexible tie, and the other is made in the form of a loop which is connected using a peg to another loop which is fastened on the pallet, and above the pallets is a guide which is connected using a flexible tether to all the pegs for ensuring their extraction from the loops in front of the dropping position.

2. Device for disposition and dropping of cargoes from an aircraft, which contains pallets which are placed along the lengthwise axis of the aircraft and which are designed for disposition of cargoes on them, disconnectable attachments for securing the pallets on the aircraft and disconnectable attachments for securing the cargoes on the pallets and for ensuring movement of the cargoes under the action of their weight to the dropping position which is located in the rear part of the aircraft, characterized in that there are guides for placing pallets on them and a means for fixing of pallets in front of the dropping position, and each attachment for securing the cargoes on the pallet is made in the form of net formed by one circular and

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several radial ties, one end of each of which is connected to a circular flexible tie, and the other is made in the form of a loop which is connected using a peg to another loop which is fastened on the pallet, and above the pallets along the aircraft is a guide which is connected using a flexible tether to all the pegs for ensuring their extraction from the loops in front of the dropping position.

3. Device as claimed in any of Claims 1 and 2, wherein the means for fixing the pallets in front of the dropping position is made in the form of an elastic, flexible tie, one end of which is connected to the pallet, and the other to the aircraft.

4. Device as claimed in any of Claims 1 and 2, wherein the circular flexible tie is made compound, of two parts, the two ends of which are equipped with rings interconnected by a peg which is connected to a flexible tether, and the other two ends are interconnected by an adjustable connection.

5. Device as claimed in Claim 2, wherein between the guides is a roller track on which the pallets are placed, the means for fixing the pallets in front of the dropping position is made in the form of an elastic tie, one end of which is connected to a pallet, and the other to the aircraft, and also a stop mounted on the aircraft outside the roller track along the path of the pallets, with a height which does not exceed the height of the roller track.

6. Device as claimed in any of Claims 1 and 2, wherein the attachment for securing the cargoes contains a flexible tie, the ends of which are attached to the sides of the cargo compartment in the zone of the ramp, and the middle part with the upper part of the cargo compartment is attached in the zone of the ramp.

Figure 1

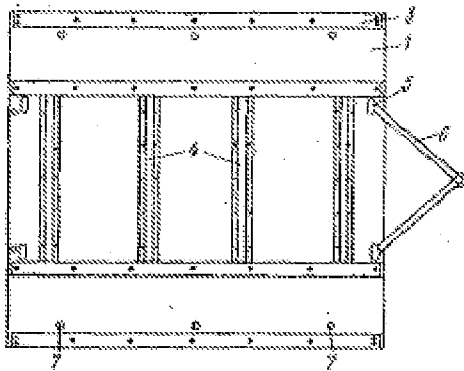
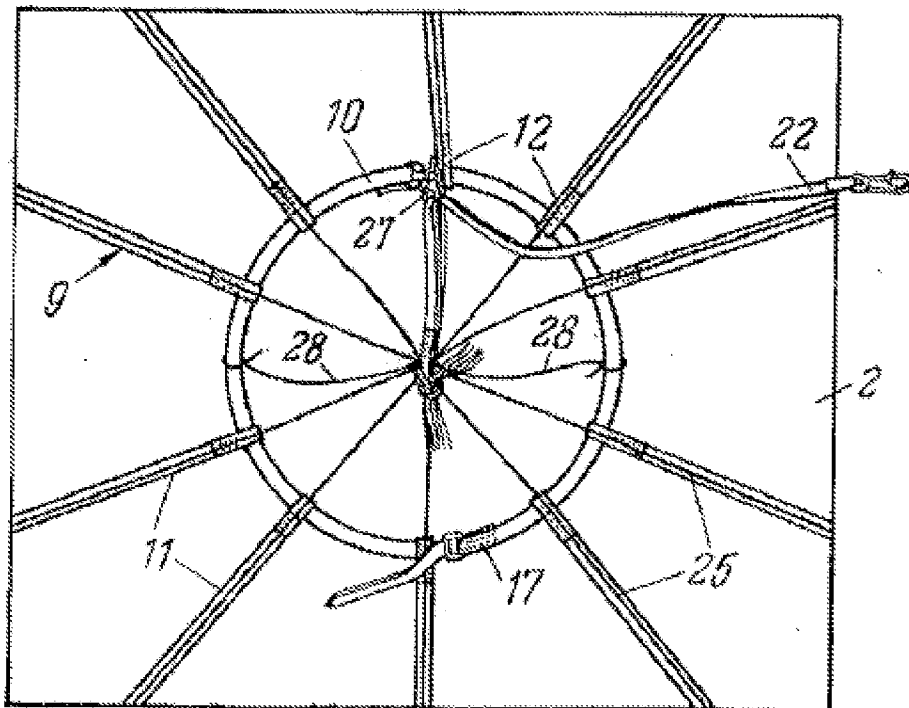


Figure 2



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Figure 3

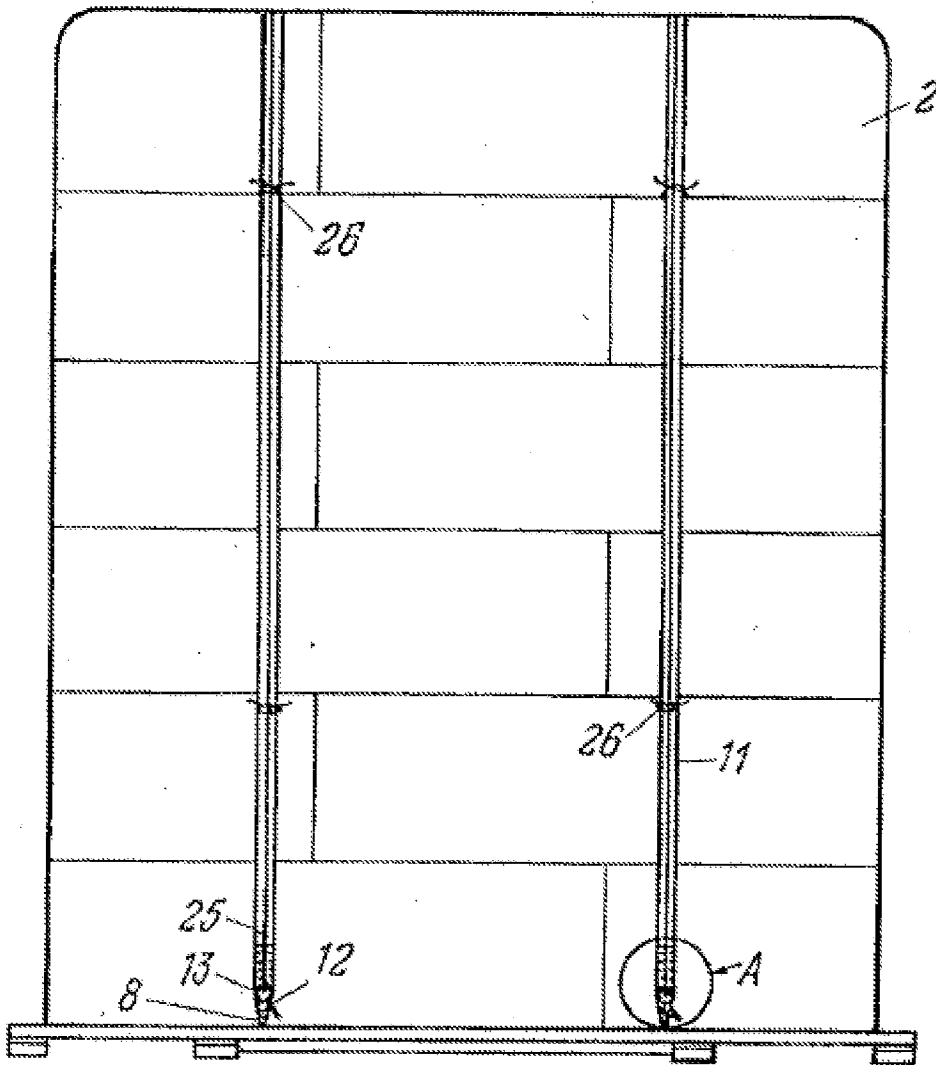


Figure 4

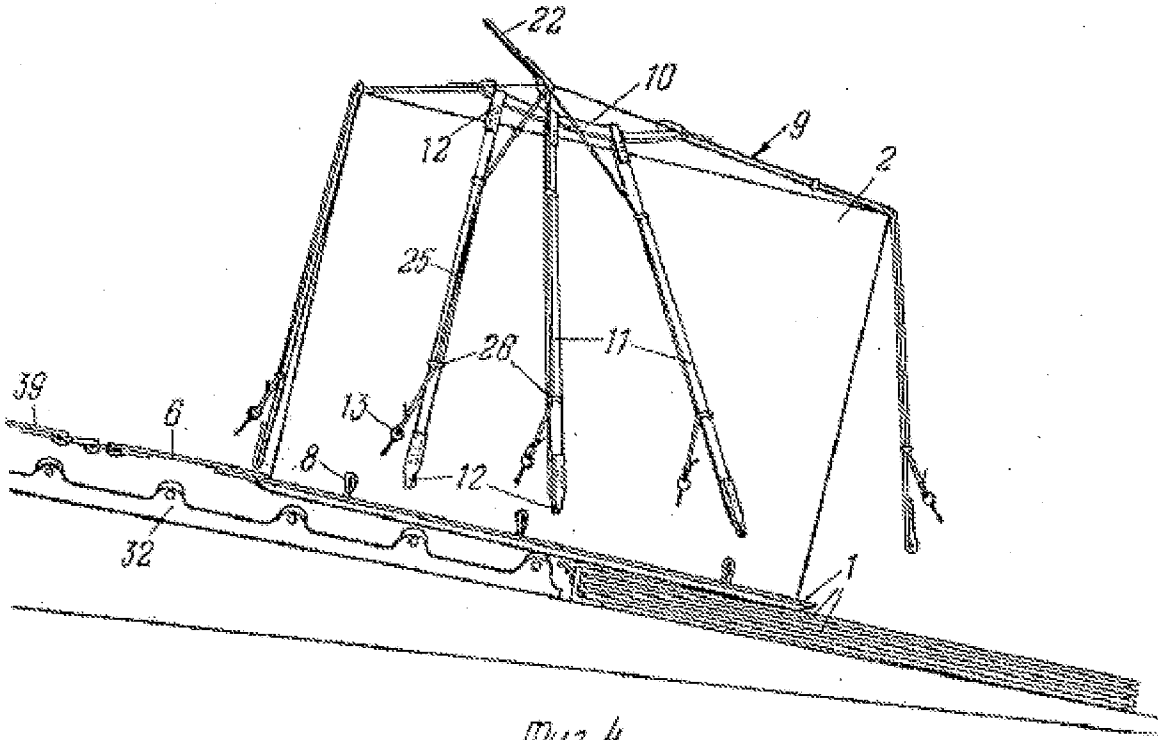


Figure 5

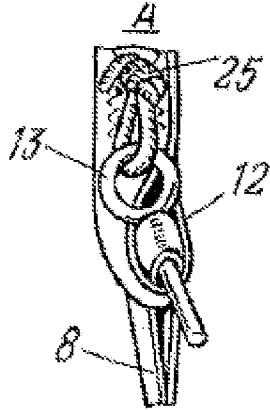


Figure 6



Figure 7

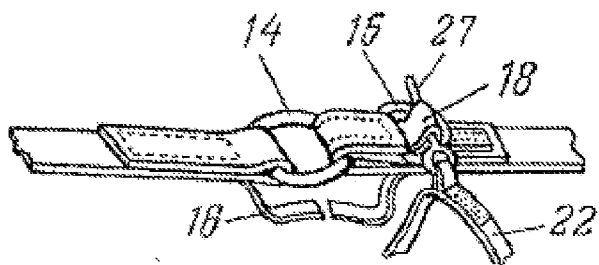


Figure 8

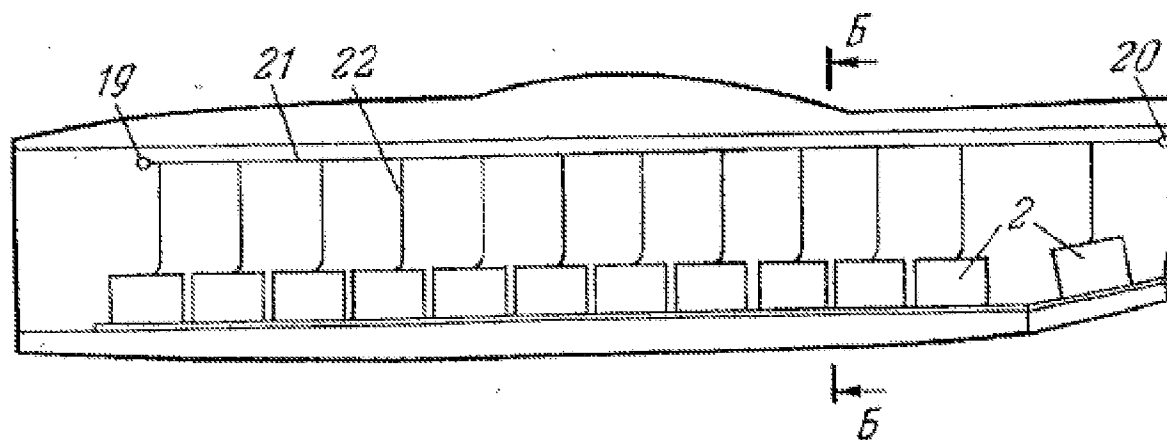


Figure 9

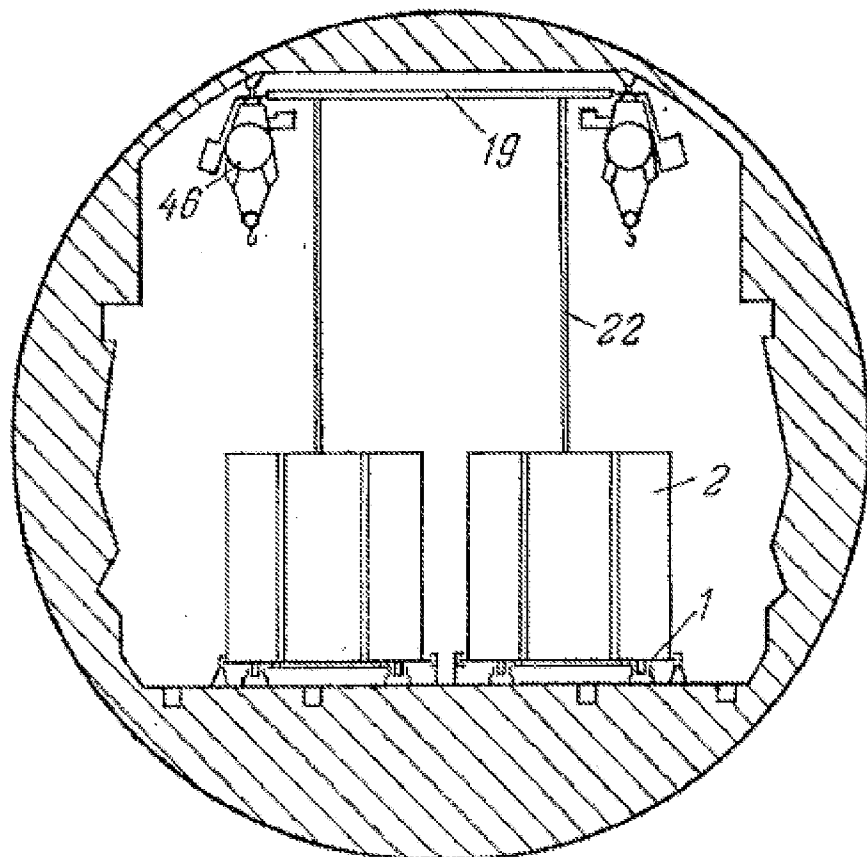
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Figure 10

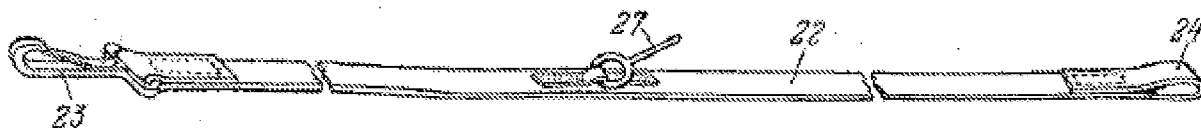


Figure 11

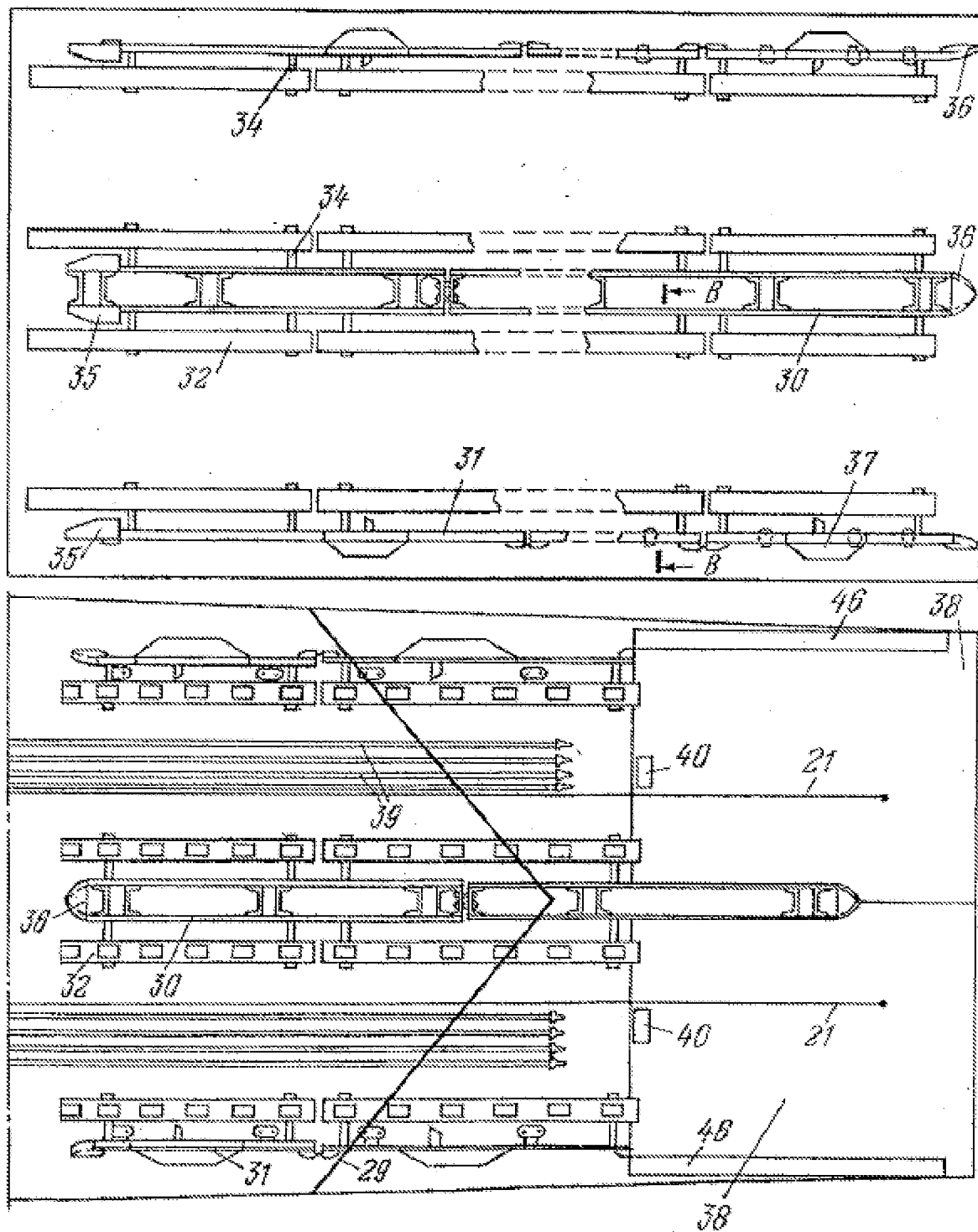


Figure 12

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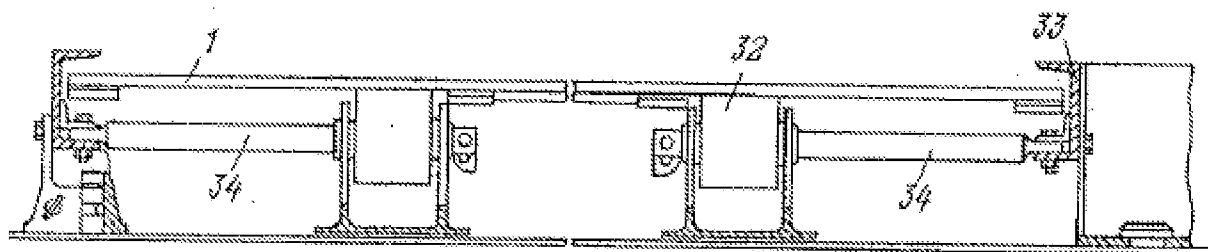


Figure 13

